

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) An automated simulation method for determining enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the Dirac coulombic tunnelling integral, comprising the steps of:

assigning the variable C to the ratio of the Poole-Frenkel barrier lowering energy (ΔE_{fp}) divided by the energy range for which tunnelling can occur (ΔE_n);

assigning the value $(C+1)/2$ to a variable v and performing a second order Taylor's series expansion of the Dirac coulombic tunnelling integral around v to determine a maximum value (u_{max}) for the variable u of the integral;

determining if the value for u_{max} is less than C , is between C and 1 or is more than 1;

assigning the value of C to the variable v if u_{max} is less than C ;

assigning the value of u_{max} to the variable v if u_{max} is between C and 1;

assigning the value of 1 to the variable v if u_{max} is more than 1;

reducing the Taylor's series expansion of the Dirac coulombic tunnelling integral to an error function;

reducing the error function to simple exponential functions by applying rational approximations to the error function; and

calculating the enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the said simple exponential functions;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

2. (Previously Presented) An automated simulation method which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the approximated tunnelling equation set out as equation 26 herein;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

3. (Previously Presented) An automated simulation method which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the approximated tunnelling equation set out as equation 27 herein;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

4. (Canceled)

5. (Previously Presented) A simulator for determining enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the Dirac coulombic tunnelling integral, comprising:

means storing a variable C having a value equal to the ratio of the Poole-Frenkel barrier lowering energy (ΔE_{fp}) divided by the energy range for which tunnelling can occur (ΔE_n);

means which assign the value $(C+1)/2$ to a variable v and perform a second order Taylor's series expansion of the Dirac coulombic tunnelling integral around v to determine a maximum value (u_{max}) for the variable u of the integral;

means which determine if the value for u_{max} is less than C , is between C and 1 or is more than 1;

means which assign the value of C to the variable v if u_{max} is less than C ;

means which assign the value of u_{max} to the variable v if u_{max} is between C and 1;

means which assign the value of 1 to the variable v if u_{max} is more than 1;

means storing simple exponential functions derived from applying rational approximations to an error function obtained by reducing the Taylor's series expansion of the Dirac coulombic tunnelling integral; and

means which calculate the enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the said simple exponential functions;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

6. (Previously Presented) A simulator which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device comprising means which calculate the approximated tunnelling equation set out as equation 26 herein;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

7. (Previously Presented) A simulator which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device comprising means which calculate the approximated tunnelling equation set out as equation 27 herein;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

8.-18. (Canceled)

19. (Currently Amended) ~~The method of claim 1, comprising~~ A method of manufacturing a semiconductor device based on the leakage-current. current estimated by the method according to claim 1.

20. (Currently Amended) ~~The method of claim 2, comprising~~ A method of manufacturing a semiconductor device based on the leakage-current. current estimated by the method according to claim 2.

21. (Currently Amended) ~~The method of claim 3, comprising~~ A method of
manufacturing a semiconductor device based on the leakage ~~current~~ current estimated by the
method according to claim 3.

22.-24. (Canceled)